Winter temperature variation of southwest China over the past 300 years based on a Bayesian approach

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Supplementary Figures

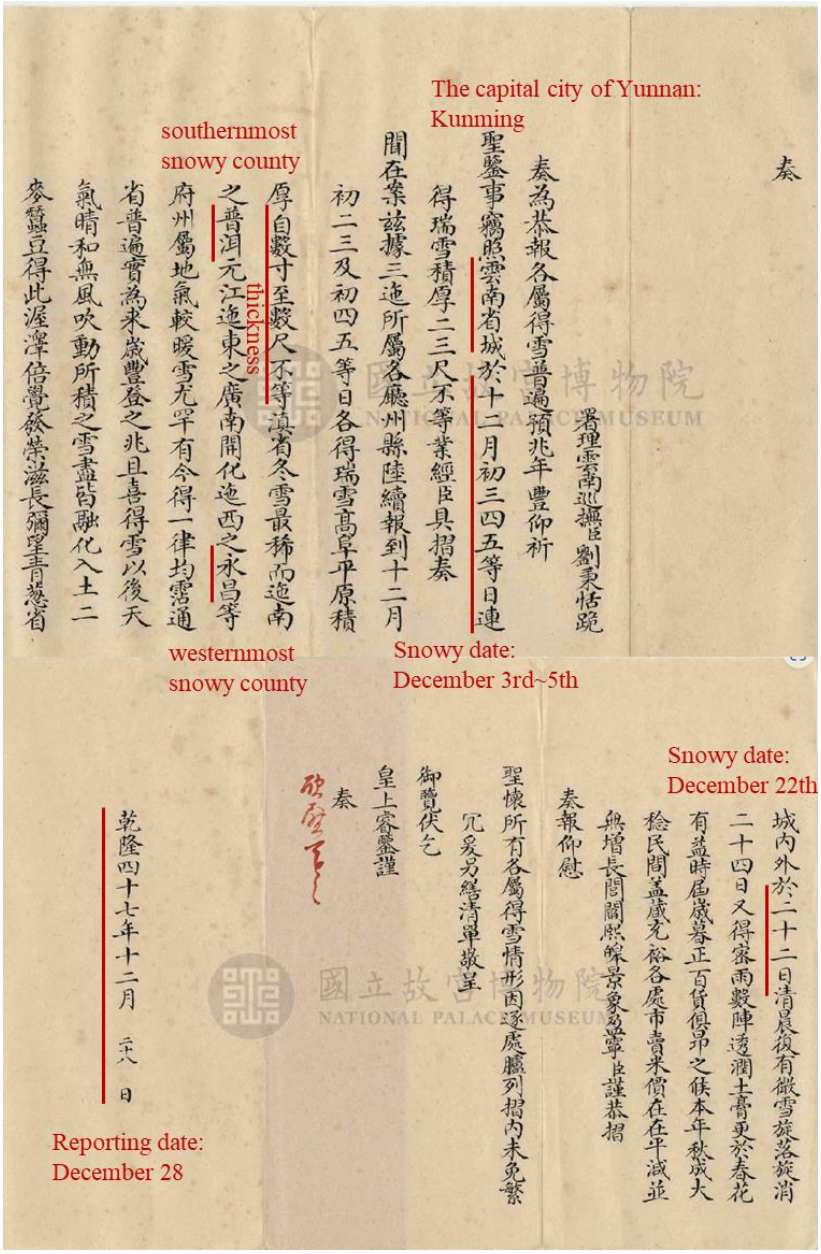

Fig. S1 A *Yu-Xue-Fen-Cun* archive of December in the 47th year of the Qianlong reign on lunar calendar, corresponding to the period from January 3 to January 30 in 1783. Four snowy days in Kunming during the 28 days were reported, in which three days with accumulation; mentioning the southernmost and westernmost snowy counties.
(https://qingarchives.npm.edu.tw/index.php?act=Display/image/11891816=so15T#b5l)

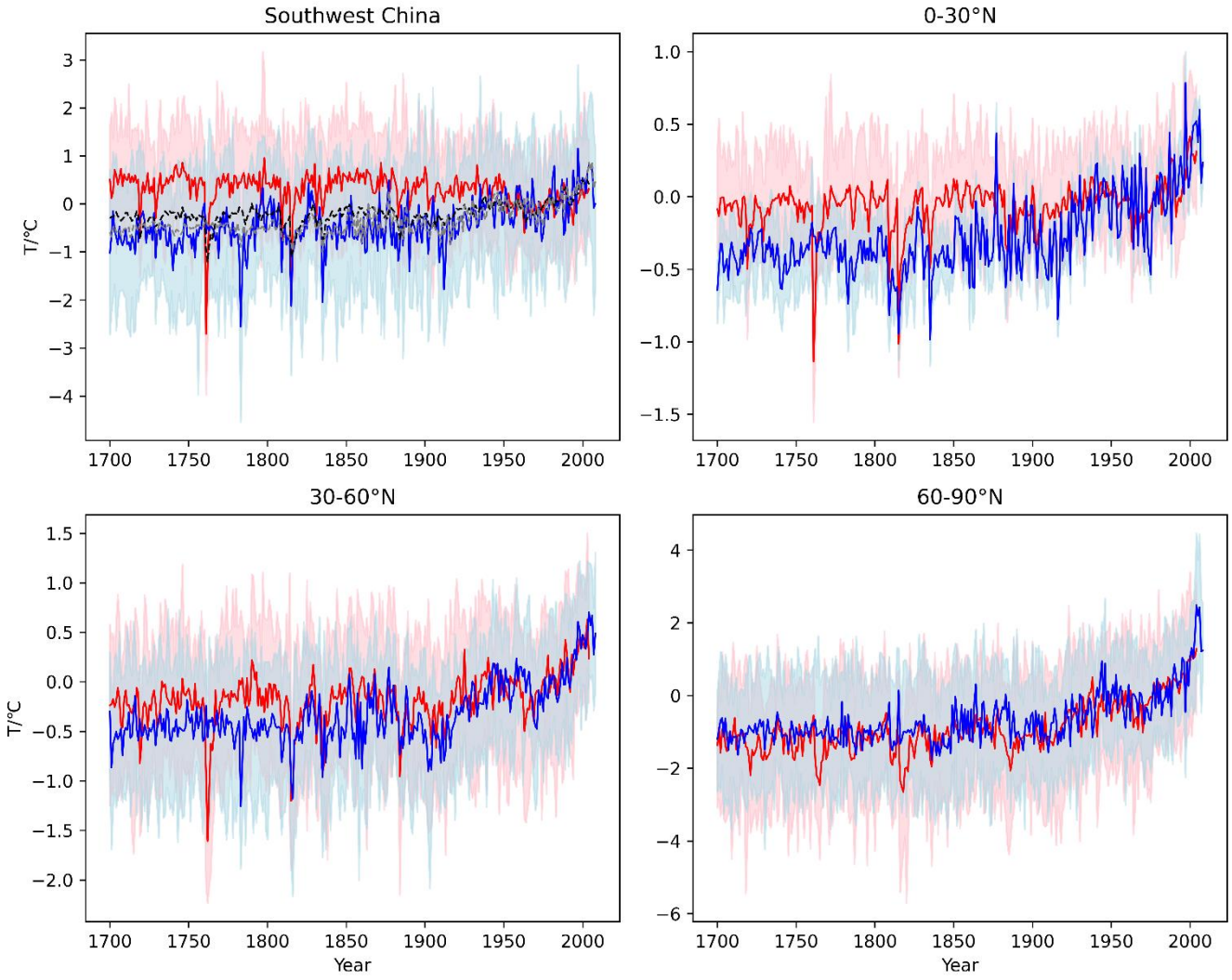

Fig. S2. Winter mean temperature extracted from ModE-Sim and CESM-LME: The upper-left panel shows winter temperatures in Southwest China (area-weighted), with blue representing ModE-Sim and red representing CESM-LME. The grey and black dotted lines indicate Northern Hemisphere temperatures (latitude-weighted) based on ModE-Sim and CESM-LME. The other three panels are temperatures for the low-latitude (0–30°N), mid-latitude (30–60°N), and high-latitude zone (60–90°N).

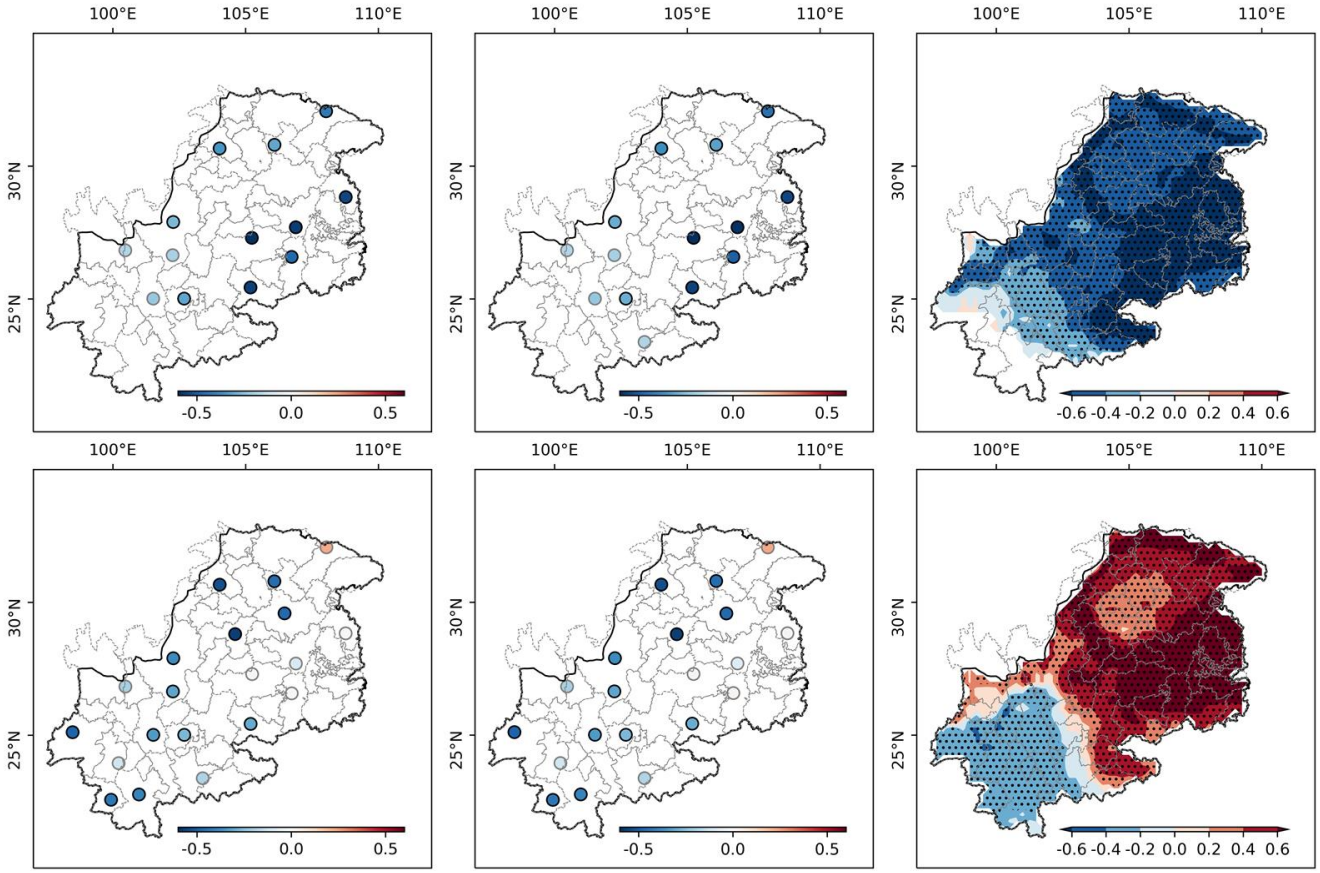

Fig. S3. Correlation of snowy-day (top row) and rainy-day (bottom row) with regional temperature, discriminated by thresholds of 0℃ (left column) and 1℃ (middle column), in the GHCNd dataset (1951-2019) and era5 datasets (right column) (1940-2022).

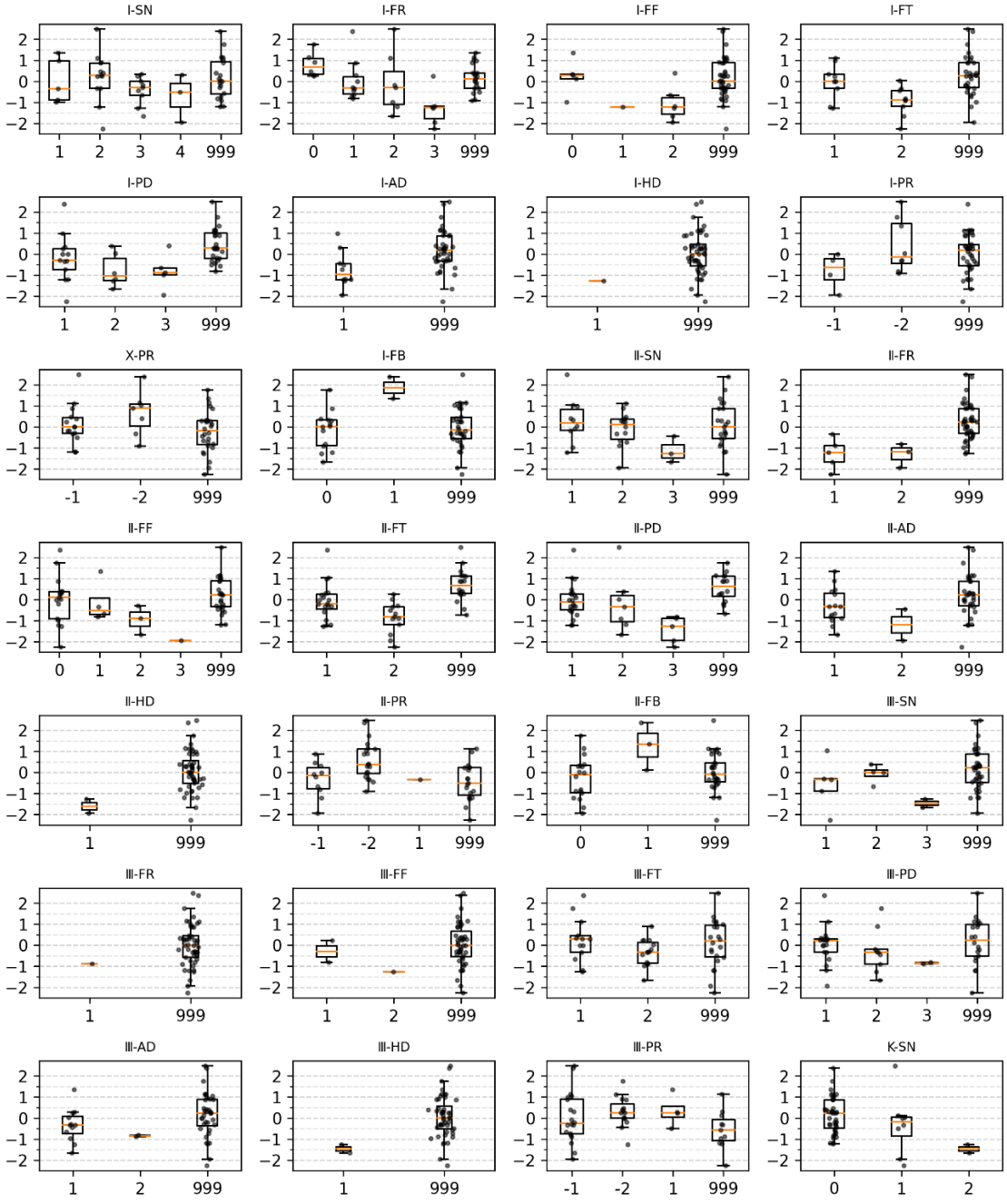

Fig. S4. Regional winter temperatures corresponding to different phenomena observed in subregion I, II and III. For each panel, the vertical axis is regional temperature standard deviation, while the horizontal axis denotes the level of the phenomenon, as detailed in Tab. S1. SN is snowfall, FR is freezing rain, FF is frozen, FT is frost, PD is plants death, AD is animal death, HD is human death, PR is precipitation, FB is flower blooming; X-PR represents precipitation in northeast Yunnan Province. In this region, the temperature-precipitation relationship based on GSOD and DFDP data exhibits inconsistencies, necessitating separate statistical analysis. K-SN denotes the snowfall amount for Kunming County and surrounding areas.

Supplementary Tables

Tab. S1 The classification of each phenomenon derived from the literature and its corresponding description

Category	Level	Description
Snowfall (SN)	0	no snow; snowfall without accumulation;
	1	snowfall only lasting one day with accumulation
	2	heavy snowfall (depth ⩾ 1 *chi*); snowfall lasting two to four days; two separate snowfalls with accumulation;
	3	extremely heavy snowfall (depth⩾3 *chi*); snowfall lasting five or more days; three or four separate snowfalls with accumulation; two separate heavy snowfalls;
	4	snowfall lasting ten or more days; five or six separate snowfalls with accumulation; three or four separate heavy snowfalls;
	5	persistent snow lasting more than one month; seven or more separate snowfalls with accumulation; five or more separate heavy snowfalls;
Freezing rain (FR)	0	no frozen rain;
	1	frozen rain lasting less than 10 days;
	2	freezing rain lasting less than 30 days; two separate frozen rain lasting less than 10 days;
	3	freezing rain lasting more than one month; two separate frozen rain lasting more than 10 days;
Frozen (FF)	0	no ice and frozen;
	1	thin ice on pond and paddy field surfaces;
	2	thick ice on pond and paddy field surfaces; water pipes and tanks cracked due to freezing;
	3	partially to fully frozen rivers/lakes;
Frost (FT)	0	no frost;
	1	limited-area/moderate frost;
	2	widespread/severe frost;
Plants damage (PD)	1	crop and vegetable death due to coldness;
	2	tropical plants mortality caused by coldness;
	3	tree mortality caused by coldness;
Animal death (AD)	1	livestock deaths due to coldness;
	2	wildlife (fish, birds) mortality due to coldness;
Human death (HD)	1	cold-induced mortality in humans;
Flower bloom (FB)	1	flowers blooming in winter;
Somatosensory feeling (FL)	-1	feeling cold;
	1	feeling warm;
Precipitation (PR)	-2	widespread/seasonal/severe drought;
	-1	limited-area/monthly/moderate drought;

	1	heavy rainfall in winter;
	2	persistent rainy;